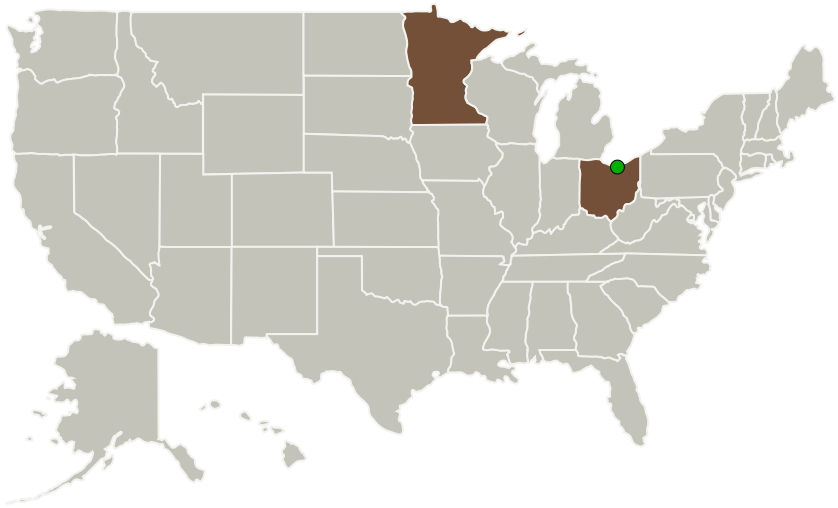
Miniature Sensor for Aerosol Mass Measurements, Phase I

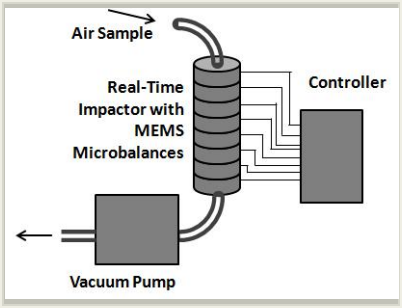
Completed Technology Project (2014 - 2014)

Project Introduction

This SBIR project seeks to develop a miniature sensor for mass measurement of size-classified aerosols. A cascade impactor will be used to classify aerosol sample into 8 uniform bins on a logarithmic scale, covering an aerodynamic size range of 0.01 to 10 microns. In each of the 8 stages aerosols will be deposited on a MEMS microbalance that will record aerosol mass in real-time. The proposed device incorporates state-of-the-art MEMS microbalances from the subcontractor femtoScale in the applicant MSP Corporation's advanced cascade impaction technology. With the help of a consultant, who has decades of experience in airborne aerosol measurements, we propose to adapt this device to unpiloted aircrafts, like Black Hawk for NASA's Airborne Science Program. During Phase I, we propose to design a miniature cascade impactor with a low flow rate of 0.5 liters per minute or smaller. A prototype will be built with 8 stages pertaining to 8 aerosol size classes. MEMS microbalance on each stage will measure the deposited aerosol mass with a frequency of 1 Hz. This prototype will be tested and validated in Phase I and the final flight-worthy deliverable will be built in Phase II. The proposed device is expected to weigh less than 5 kg and consume about 100 W electrical power. Besides being valuable for NASA's airborne science program, this instrument will have numerous R&D and industrial monitoring applications that need real-time aerosol measurements down to 0.01 micron.

Primary U.S. Work Locations and Key Partners





Miniature Sensor for Aerosol Mass Measurements Project Image

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Organizations Performing Work	Role	Type	Location
MSP Corporation	Lead Organization	Industry	Shoreview, Minnesota
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Minnesota	Ohio

Project Transitions

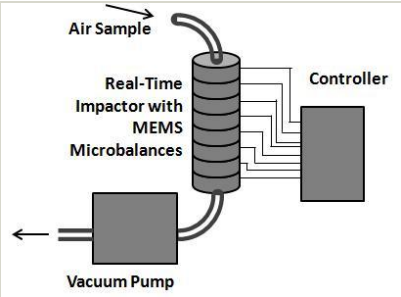
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137532)*

Images



Project Image
Miniature Sensor for Aerosol Mass Measurements Project Image *(https://techport.nasa.gov/image/129121)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
MSP Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

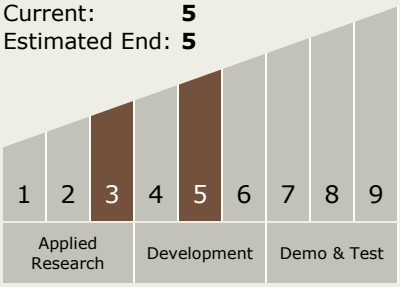
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Amir Naqwi

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System